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Northampton, Mass., Jan. 25, 1918. No. 53



The third meeting of the American Society of Ichthyologists and Herpetologists was held in The University Museum at Cambridge, Mass., Friday, November 16, 1917.

The Business meeting was called to order at 9.15 in The Museum of Comparative Zoölogy, Dr. Barbour of the local arrangements committee in the chair; present—Barbour, Dunn, Fowler, Murphy, Nichols, Noble, Ruthven, and later Schmidt and Wright.

The minutes of the previous meeting in Philadelphia were read and approved.

Twenty-two new members were elected to the Society. Dr. Wright of Cornell and Mr. Schmidt of the American Museum were elected to the board of Governors.

It was decided that members and governors in arrears for dues be dropped from the roll of the Society at the discretion of the Treasurer.

The following officers were elected by ballot: President, Dr. Leonhard Stejneger; Vice-presidents, Dr. Thomas Barbour and Dr. A. G. Ruthven; Treasurer, Mr. Henry W. Fowler; Secretary, Mr. John T. Nichols.

The Treasurer submitted a statement that something over \$100 was at the time in the Treasury. It was voted to issue an abstract of the Proceedings of the present meeting at an expense not to exceed \$50.00 and \$50.00 was set aside for "Copeia." Mr. E. R. Dunn was appointed to attend to the abstract.

The Business meeting adjourned at 10.15.

The Public Sessions convened at 10.45 in the Nash Botanical Lecture Room, Vice-President Barbour in the chair.

Papers were read by A. G. Ruthven, A. H. Wright, G. H. Parker, H. W. Fowler, E. R. Dunn, J. T. Nichols.

A recess for luncheon (in Dr. Barbour's office) was taken at 1.00, and the session reconvened at 2.10. Papers followed by G. M. Allen (discussion by Brewster, Ruthven, Wright and others), A. C. Redfield, Thomas Barbour, Woodworth, and G. K. Noble.

Papers by A. H. Wright, F. G. Speck, A. B. Dawson, H. L. Babcock, and E. R. Dunn were read by title.

A vote of thanks was passed to Harvard University for facilities courteously extended to the Society, to the local arrangements committee for the efficiency with which they had done their work and to Dr. Thomas Barbour for his courtesy and generosity.

Meeting adjourned at 5.50.

JOHN T. NICHOLS, Secretary.

TWO AMPHIBIANS WITH ASIATIC AFFINITIES FROM THE STATE OF WASHINGTON. Dr. A. G. Ruthven, University of Michigan.

Dr. Ruthven exhibited specimens of two amphibians with Asiatic affinities from the State of Washington, *Ranodon olympicus* H. T. Gaige and *Ascaphus truei* Stejneger. The distribution and affinities of these forms were briefly discussed, and a brief account was given of the habits and habitats of series of specimens of both species acquired by the Museum.

FISH SUCCESSION IN THE WATER COURSES OF LAKE ONTARIO. Dr. A. H. Wright, Cornell.

Ten streams of Monroe Company, N. Y. were studied in 1904. They are in the bed of Old Lake Iroquois, i. e., postglacial and comparatively recent. Compared with these are streams in the highlands of Ontario, Cayuga Lake tributaries, and a few head streams of the Susquehanna.

Beginning with a diminutive rivulet or developing small creek the first occupants are almost sure to be the common sucker, the horned dace and quite likely the black-nosed dace. The succeeding forms are decidedly soft-rayed species and are more or less in the following

sequence: red-bellied minnow; fathead minnow; red-sided minnow or Cope's minnow; blunt-nosed minnow; and the common shiner. Then, the diminutive spiny-rayed species and larger carnivores begin to appear, namely: brook stickleback; fan-tailed darter; miller's thumb; river chub; stone roller minnow; pike; and grass pike.

From the beginning of muddy conditions or about the time of the ingress of the pike the successive appearances are: common bullhead; common sunfish; golden shiner; perch; rock bass; large mouth bass; black bullhead; tadpole cat; mud minnow; Johnny darter; barred killifish; chub sucker; Cayuga minnow; bowfin; yellow cat; pirate perch; mud darter; and small mouth bass.

The last or so-called swift gravelly group begins with the small mouth bass followed by the satin-fin minnow; silver-sided minnow; log perch; spot-tail minnow; hog-nosed sucker; silvery minnow; long-nosed dace; eel; lamprey; calico bass; gar; stone cat; green-sided darter; straw-colored minnow; barred mad tom; red horse; bluegill; sheepshead and wall-eyed pike. At present the marine two-spined stickleback from the east is entering the Monroe Co. streams while the gizzard shad of the west is invading our Cayuga Lake tributaries.

HEARING IN FISHES. Dr. G. H. Parker, Harvard.

Dr. G. H. Parker gave an account of experiments on the hearing of *Ameiurus nebulosus*, the common catfish of New England.

A brief resume of the theories in regard to the sense of hearing in fishes was given, beginning with Izaak Walton.

The recent work of European investigators had seemed to show that fish could not hear, but the fact that one worker obtained a reaction to sound in the catfish suggested possibilities. These possibilities were more than suggested, when, during the preliminary experiments, some fish in an aquarium in the basement reacted strongly to the slamming of a door two floors above.

The ear, the skin, and the lateral line organs were investigated.

Means were taken to eliminate any or all of these organs without impairing too much the activities and length of life of the fish.

The skin was found to be stimulated by the dropping of water, by water currents, by a slow vibratory movement of the whole body of water, by the impact of a leaden ball on the slate wall of an aquarium, by the lower tones from a submerged telephone, but not by the higher ones, nor by a whistle blown in the air. The responses to these stimuli were locomotor.

The lateral-line organs were stimulated by a slow vibratory movement of the whole body of water, by the impact of a leaden ball on the slate wall of an aquarium, and by the lower tones from a submerged telephone, but not by the other stimuli named above. The responses were inhibitions of those initiated through the skin and ear.

The ear was stimulated by a vibratory movement of the whole body of water, by the impact of a leaden ball on the slate wall of an aquarium, by a whistle blown in the air, and by all but the highest notes of the submerged telephone. It was not stimulated by the dropping of water by water currents, or by the highest tones of the submerged telephone. The responses were locomotor.

Lack of positive results on the part of European investigators was considered mainly due to faulty technique.

SOME FISHES OF THE DELAWARE DRAINAGE SYSTEM. Mr. H. W. Fowler, Academy of Natural Sciences. (No abstract.)

NOTES ON SOME LARVAL SALAMANDERS by Mr. E. R. Dunn, Smith College.

Larval salamanders are of interest not only to the student of life-histories and breeding habits, but also to the faunal naturalist, because often, owing to peculiar habits on the part of the adult, larvae alone represent the species in collections from possibly very interesting localities.

Particular instances of this are the various species of *Ambystoma* and *Gyrinophilus*. Larvae of *Gyrinophilus* are found quite frequently, whereas the adult is rarely found. Similarly the adults of many species of *Ambystoma* are found only by accident except in the breeding season, while larvae may be common enough in the ponds throughout the summer.

Determination of larvae for any one locality presents no great difficulties.

GROUND SHARKS OF FLORIDA AND ELSEWHERE

by Mr. J. T. Nichols, American Museum of Natural History.

Mr. Nichols spoke first of the Ground sharks of the genus *Charcharinus* in the neighborhood of Long Island. These sharks are found quite commonly from the middle of June to the first part of September.

The interesting fact about them is that the two sexes of the same species are almost never taken together near Long Island.

The great majority of sharks taken around Long Island are female *Charcharinus milberti*. Most of the few males belong to *Charcharinus obscurus*. Very rarely males of *C. limbatus* and *C. milberti* are taken.

This segregation of the sexes is also found on the Florida coast where however other species are prevalent, especially *C. lamia*.

DISCUSSION OF FOWLER'S TOAD.

This discussion was begun by Dr. G. M. Allen, who gave a brief history of Fowler's toad up to the time of the publication of Miss Dickerson's Frog Book. He exhibited the types of *Bufo fowleri* and several specimens of *B. americanus*.

Dr. Ruthven spoke of finding it in Michigan and of reports of its existence in other parts of the middle West. Mr. Dunn spoke of its habits in the neighborhoods of Philadelphia and Washington, in the North Carolina mountains, and at Northampton, Mass. Dr. Brewster spoke of its occurrence on Cape Cod. Dr. Wright told of finding it breeding in Virginia and North Carolina. Dr. Batchelder told of his experience with this toad in eastern Massachusetts. Mr. Schmidt told of first hearing it in southeastern New York and New Jersey, and of taking specimens in Louisiana. Mr. Murphy gave an account of its variations on Long Island. Dr. Mark and Dr. Barbour also entered into the discussion.

Points brought out were: Fowler's toad is quite distinct from *Bufo americanus*; it will probably be found to range over the entire Eastern half of the country; and that if due consideration is given to the variability of the forms in question it is not difficult to tell the two apart.

THE PHIOSIOLOGY OF THE CHROMATOPHORES OF THE HORNED TOAD. Dr. A. C. Redfield.

Phrynosoma cornutum shows quite a considerable color change from dark to light and vice-versa.

This change is caused by the contraction of the chromatophores.

These are stimulated by heat and cold, light and darkness, emotion, and visual impressions. The heat and light stimuli act directly on each individual chromatophore. Emotion, during which the animal becomes "pale with rage" effects the adrenal glands causing the production of adrenalin which being brought by the blood to the chromatophores, causes them to contract.

To a much slighter extent emotion effects the chromatophores through the sympathetic nervous system.

Visual impressions of the animal's surroundings cause it to alter its color to suit its background. A simple proof of this is that blindfolded animals do not alter their color to fit their surroundings.

LOWER VERTEBRATE FOOTPRINTS FROM THE UPPER CARBONIFEROUS SHALES OF PLAINVILLE AND ATTLEBORO, MASS. Dr. J. B. Woodworth, Harvard.

While the Dinosaur footprints of the Connecticut valley are famous, it is not generally known that much earlier footprints of lower vertebrates also are found in New England. Slides were shown which made clear the locality and geologic position of these footprints, and the prints themselves were shown by slides and passed around for individual inspection.

THE CHECK LIST OF NORTH AMERICAN REPTILES AND AMPHIBIANS. Dr. T. Barbour, Museum of Comparative Zoölogy.

Dr. Barbour gave a general outline of the plan of the Check List, which was being gotten out by Dr. Stejneger and himself, and was to be issued in the near future.

He mentioned a few of the more important nomenclatorial changes, most of which were due to the vagaries of Rafinesque and his habit of publishing his descriptions anywhere and everywhere.

LIFE HISTORY OF THE MARSUPIAL FROG. Mr. G. K. Noble, Harvard.

Mr. Noble showed slides of the Peruvian coast and the Andes, giving various details of his trip across the

coastal desert, the three main ridges of the Andes, and as far as the River Marañon, the headwaters of the Amazon.

The marsupial frog, usually known as *Nototrema*, was found fairly commonly and was made the subject of special study.

The pouch is present only in the female and in fact the male is a very different looking creature.

When not filled with eggs the pouch is almost non-existent as it is made by an invagination of the skin of the back.

Physiologically the very large blood supply to the skin of the pouch and the peculiarly modified gills of the tadpoles indicate a very specialized method of oxygenation.

BREEDING HABITS OF SOME SOUTHERN AND WESTERN FROGS. Dr. A. H. Wright. (Read by title, no abstract.)

TESTING FOLK LORE BY OBSERVATION ON BUTLER'S GARTER SNAKE. Dr. Frank G. Speck. (Read by title, no abstract.)

NOTES ON SOME NEW ENGLAND TURTLES. H. L. Babcock, M. D., Boston. (Read by title.)

The last list of the Reptilia of New England, which was prepared in 1904 by Mr. Samuel Henshaw for the Boston Society of Natural History, recognized thirteen species of turtles. Since that list was published there have come to light records of four more: (1) Mühlenberg's Turtle, *Clemmys Mühlenbergii*; (2) the Red-bellied Terrapin, *Pseudemys rubriventris*; (3) the Hawk's-bill Turtle, *Chelonia imbricata*; and (4) the Mud Turtle; *Cinosternum pennsylvanicum*; making a new total of seventeen species for New England. These additions occurred in the following manner.

In 1902, three specimens of *Clemmys Mühlenbergii* were collected at Newport, R. I., by Alexander Agassiz and presented to the Museum of Comparative Zoölogy at Cambridge where they now are. While it is possible that these were escaped caged animals, it is not likely. This turtle is not generally abundant throughout its range and often occurs locally as in this instance. This record establishes a new northern limit of distribution, and also adds a new species to the fauna of New England.

The Red-bellied Terrapin has been known for some years in inhabit certain ponds in a sandy region of Plymouth County, Massachusetts, where it seems to remain sharply localized. The range of this turtle has not been recorded north of New Jersey with this exception. Dr. Stejneger writes me that the most northern record in the National Museum is from Beasleys Point, New Jersey.

A specimen of the Hawk's-bill sea turtle was taken in 1909 in connection with the work at the Marine Biological Laboratory at Woods Hole, Cape Cod, Massachusetts.

Cinosternum pennsylvanicum is, perhaps, of doubtful occurrence in New England, although it should be found in the southern part. It was included in an early list of the reptiles of Massachusetts by Hitchcock in 1833, although he may have confused it with *Aromochelys odoratus*. Linsley does report one specimen from Stratford, Connecticut in 1843.

Some of our New England Turtles illustrate interesting facts in distribution. The Geographic Terrapin and the Spiny Soft-shelled Turtle, both of which have their headquarters in the Mississippi Valley, find their way through various waterways into the St. Lawrence Valley and Lake Champlain, and thus become members of the New England fauna.

In Blanding's Turtle, a comparatively rare New England species, we find another interesting study in distribution, for its nearest relative—in fact the only other species of the genus—is the *E. orbicularis*, or European Pond Turtle of middle and southern Europe.

Perhaps the most remarkable example is that of the common Snapping Turtle, which occurs, with closely related species, from Canada, through eastern North America, to Ecuador in South America. The only other genus of this family occurs in the Fly River, New Guinea, the river that has also furnished that remarkable turtle *Carettochelys*. This was reported in 1905 by J. Douglas Ogilby and is, as Hay remarks, even more remarkable than the distribution of the camels and tapirs.

A PRELIMINARY LIST OF THE REPTILES AND AMPHIBIANS OF VIRGINIA. Mr. E. R. Dunn, Smith College. (Read by title.)

This list and key is intended to facilitate study of the herpetological fauna of Virginia, to put on record the

present state of our knowledge, and to serve as a preliminary to a more extended paper on the same subject. It is hoped that the key, covering, as it does, most of the species of the Northeast, will be useful to amateurs and general zoölogists.

Records are given by counties. There are 100 counties in the state. Records were given for 60 of them. However there are only 16 counties from which 10 or more species are known. These are: Fairfax, 47; Alexandria, 37; Nelson, 35; Clarke, 30; Norfolk, 27; Augusta, 21; Caroline, 21; Fauquier, 20; Page, 17; Wythe, 16; Accomac, 15; Elizabeth City, 13; Northampton, 12; Loudoun, 11; Bath, 10; Gloucester, 10. Fairfax and Alexandria counties which form really one unit have together 50 species.

Localities italicized are records only. Other localities are specimens I have seen, either from my own collecting or from the collections of the National Museum, the Academy of Natural Sciences, the Museum of Comparative Zoölogy, the American Museum, the Museum of Cornell, or the Museum of Washington Lee, to whose authorities I am deeply indebted. I have done more or less personal collecting in Alexandria, Amherst, Augusta, Bath, Buckingham, Clarke, Fairfax, Fauquier, Fluvanna, Frederick, Loudoun, Nelson, Rockingham, and Shenandoah counties.

Leaving out local races, which are not taken into consideration in this paper, there are known from the state 79 species of Amphibians and Reptiles. The groups are represented as follows: Salamanders, 21; Frogs and Toads, 15; Turtles, 12; Lizards, 5; Snakes, 26.

In nomenclature I have followed the checklist of Stejneger and Barbour except in one or two cases.

I am especially indebted to Mr. H. W. Fowler and to Dr. A. H. Wright for Virginia records.

EXPLANATION OF TECHNICAL TERMS.

I have striven to free the key from technical terms as much as possible but a few were unavoidable. I have been at some pains trying to make the key at once simple and thorough.

Dorsal means pertaining to the back.

Lateral means pertaining to the side.

Costal grooves in salamanders are grooves on the

sides between the fore and hind limbs which mark the position of the ribs.

Parotoid glands in toads are large wart-like swellings back of the eye.

The anal plate in snakes is the large scale in front of the vent.

The subcaudal plates in snakes are the scales under the tail.

The carapace is the upper shell of a turtle.

The plastron is the under shell of a turtle.

The neural plates are the middle row of plates on the carapace.

The costal plates are the rows on each side of the neurals.

KEY TO THE ORDER OF REPTILES AND AMPHIBIANS.

- A. No scales, skin smooth or warty. . . . *Amphibia*.
- B. A tail, fore and hind limbs about the same size.
Caudata (Salamanders).
- BB. No tail, hind limbs much the larger. . . *Salientia*
(Frogs and Toads).
- AA. Scales present, or body enclosed in a bony shell.
Reptilia.
- B. Body encased in a bony shell *Testudinata*
(Turtles).
- BB. Body not encased in a bony shell.
- C. Eyelids and earholes present. Usually four
limbs . . . *Stauria* (Lizards).
- CC. Eyelids, earholes and limbs absent . . . *Serpentes*
(Snakes).

CAUDATA (SALAMANDERS).

- A. Eel-shaped, limbs minute, no eyelids, large, reaching 2-3 feet.
- B. Hind limbs absent, fingers 4, gills present. . . *Siren lacertina* . . . Princess Anne.
- BB. Hind limbs present, fingers and toes 2, no gills.
Amphiuma means . . . Brunswick, *Elizabeth City*.
- AA. Lizard-shaped, all four limbs fairly well developed.
- B. No eyelids, large, reaching 2 feet . . . *Cryptobranchus alleganiensis* . . . Floyd.
- BB. Eyelids present, small, under 1 foot long.
- C. Toes 4. *Hemidactylium scutatum* . . . Caroline, Fairfax.
- CC. Toes 5.
- D. Costal grooves present.

- E. Teeth on roof of mouth in longitudinal rows between the eye-sockets.
- F. Tongue attached in front.
- G. No light line from eye to angle of jaw.
- H. Costal grooves 18 . . . *Plethodon cinereus*.
Alexandria, Bedford, Clarke, Elizabeth City,
Fairfax, Fauquier, Nelson, Page, Shenandoah.
- HH. Costal grooves 14.
- I. Black with green blotches . . . *Plethodon aeneus* . . . Lee.
- II. Black with white dots. . . *Plethodon glutinosus*. . . Alexandria, Augusta, Bedford, Clarke,
Fairfax, Fauquier, *Montgomery*, Norfolk,
Page.
- GG. A light line from eye to angle of jaw.
- H. Belly uniform color.
- I. Belly black. . . *Desmognathus quadramaculata*. . . Giles, Wythe.
- II. Belly pale . . . *Desmognathus monticola*.
Augusta, Clarke, Fauquier, Loudoun, Page.
- HH. Belly mottled. . . *Desmognathus fusca*.
Alexandria, Augusta, Bath, Bedford, Clarke,
Dinwiddie, Fairfax, Fauquier, Giles, King
George, Madison, Nelson, Norfolk, Page,
Pittsylvania, Rockbridge, Warwick, Wythe,
"Lynchburg to Otter Pks."
- FF. Tongue free all round.
- G. Red, tail not longer than head and body.
- H. A light line from eye to nostril . . . *Gyrino-philus porphyriticus*. . . Augusta, Loudoun,
Nelson, Page, "upper James River."
- HH. No light line from eye to nostril.
- I. Few scattered black spots. . . *Pseudotriton montanus*. . . Brunswick.
- II. Many black spots close together. . . *Pseudotriton ruber*. . . Alexandria, Bath, Bedford,
Clarke, Fairfax, Fauquier, Gloucester, Loudoun,
Nelson, Page, Shenandoah, Wythe.
- GG. Yellow, tail much longer than head and body.
- H. Tail striped.
- I. Two black dorsal stripes. . . *Eurycea bislineata* . . . Alexandria, Augusta, Clarke,
Fairfax, Fauquier, Gloucester, Loudoun,
Nelson, Page, "Lynchburg to Otter Peaks,"
"upper James River".
- II. Three black dorsal stripes . . . *Eurycea guttolineata* . . . Fairfax.

- HH. Tail crossbarred . . . *Eurycea longicauda*.
Augusta, Bath, Clarke, Giles, Wythe.
- EE. Teeth on roof of mouth in a single row across in front of eye-sockets.
- F. Markings large and definite.
- G. Markings of bars.
- H. Barred black and yellow . . . *Ambystoma tigrinum* . . . "Virginia".
- HH. Barred black and white . . . *Ambystoma opacum* . . . Fairfax, Gloucester, Hanover, Norfolk.
- GG. Two rows of round yellow spots . . . *Ambystoma maculatum*. . . Caroline, Elizabeth City, Gloucester, Stafford, Wythe.
- F. Blackish with white dots . . . *Ambystoma jeffersonianum* . . . Clarke, Wythe.
- DD. No costal grooves. Red or olive with red dots on the side . . . *Notophthalmus viridescens*.
Caroline, Fairfax, Fauquier, Franklin, Giles, Highland, Madison, Nelson, Rockbridge, Rockingham, Shenandoah, Smyth, Spottsylvania.

SALIENTIA (FROGS AND TOADS).

- A. Parotoid glands present. (Toads).
- B. Dorsal spots with one or two large warts, toad usually reddish, larger . . . *Bufo americanus* . . . Alexandria, Augusta, Bedford, Caroline, Fairfax, Highland, Page.
- BB. Dorsal spots with three to five small warts, toad never reddish, usually grayish, smaller. . . *Bufo fowleri*. . . Accomac, Alexandria, Amelia, Amherst, Augusta, Bath, Caroline, Clarke, Dinwiddie, Fairfax, Fauquier, Loudoun, Nansemond, Nelson, Norfolk, Northampton, Page, Prince William.
- AA. No parotoid glands.
- B. Ear present.
- C. Toes not webbed. . . *Pseudacris feriarum*. . . Alexandria, Fairfax, Norfolk.
- CC. Toes webbed.
- D. Noticeable adhesive disks at tips of fingers and toes, no fold of skin along side, toes webbed at base.
- E. Skin warty. . . "Tree-toad". . . *Hyla versicolor*. . . Alexandria, Caroline, Clarke, Dinwiddie, Fairfax, Fauquier, Nelson, Norfolk, Page, Shenandoah.

EE. Skin smooth.

F. An X-mark on back . . . "Peeper" . . . *Hyla crucifer* . . . Alexandria, Caroline, Fairfax, Norfolk.

FF. No X-mark on back.

G. Frog irregularly spotted, stouter . . . *Hyla squirella* . . . Nansemond.

GG. Frog uniform green, slim . . . *Hyla cinerea evittata* . . . Alexandria, Elizabeth City, Fairfax, Prince William, Surry, York.

DD. No adhesive disks noticeable. Toes webbed nearly to tips.

E. A fold of skin along side.

F. Definite spots on back.

G. Green with narrow oval spots . . . *Rana pipiens* . . . Accomac, Alexandria, Caroline, Dinwiddie, Fairfax, Norfolk, Northampton, Wythe.

GG. Brown with two rows of square spots.

Rana palustris . . . Alexandria, Augusta, Bedford, Clarke, Fairfax, Fauquier, Nelson, Page, Prince William, Roanoke.

FF. No definite spots on back.

G. No black cheek patch. Frog greenish. . . *Rana clamitans* . . . Accomac, Alexandria, Augusta, Caroline, Clarke, Dinwiddie, Fairfax, Fauquier, Nelson, Norfolk, Shenandoah, Wythe.

GG. A black cheek patch. Frog grayish brown. *Rana sylvatica* . . . Clarke, Fairfax, Page,

EE. No fold of skin along side.

F. Frog greenish, not striped, very large . . . "Bull-frog" . . . *Rana catesbeiana* . . . Accomac, Alexandria, Augusta, Clarke, Dinwiddie, Fairfax, Fauquier, Nelson, Southampton, Wythe.

FF. Frog brownish, striped, not large.

G. A triangular mark between eyes, usually a greenish stripe in middle of back, frog very small . . . *Acris gryllus* . . . Accomac, Alexandria, Bath, Caroline, Clarke, Dinwiddie, Fairfax, Fauquier, Elizabeth City, Nelson, Norfolk, Wythe.

GG. No triangular mark, no green stripe, indistinct brown stripes. Frog medium size. *Rana virgatipes* . . . Norfolk.

- BB. Ear absent . . . *Gastrophyrne carolinensis*. Caroline.

TESTUDINATA (TURTLES).

- A. Limbs paddle-shaped, 1 or 2 claws on each. "Logger-head turtle," *Caretta caretta* . . . Elizabeth City, Norfolk, Princess Anne.
- AA. Limbs not paddle-shaped, 4 or 5 claws on each.
- B. Plastron hinged, ends moveable.
- C. Plastron hinged in middle, containing 12 plates. "Dry-land terrapin" *Terrapene carolina*. . . Accomac, Alexandria, Amherst, Augusta, Bath, Clarke, Elizabeth City, Fairfax, Fauquier, Nelson, Prince William.
- CC. Plastron hinged on each side of middle, containing 11 plates,
- D. Plastron nearly closing shell, hind lobe over $\frac{1}{2}$ as wide as carapace. "Mud turtle" . . . *Kinosternon subrubrum* . . . Accomac, Alexandria, Elizabeth City, Fairfax, Mecklenburg, Northampton, Westmoreland.
- DD. Plastron not nearly closing shell, hind lobe not $\frac{1}{2}$ as wide as carapace. . . "Stinking Jim". *Kinosternon odoratum* . . . Alexandria, Caroline, Dinwiddie, Fairfax, Fauquier, Norfolk.
- BB. Plastron not hinged.
- C. Plastron narrow, cross-shaped, middle part of 9 plates. Head large, tail long . . . "Snapping turtle" . . . *Chelydra serpentina* . . . Accomac, Clarke, Fairfax, Fauquier, Loudoun, Nelson, Norfolk, Wythe.
- CC. Plastron wide, 12 plates, head and tail not very large.
- D. Neural and costal plates in straight rows across back. "Skilpot". . . *Chrysemys picta*. . . Accomac, Alexandria, Bath, Buckingham, Fairfax, Fauquier, Frederick, Nansemond, Nelson, Norfolk, Shenandoah, Rockingham, "York river".
- DD. Neural and costal plates alternating.
- E. Smaller, round yellow spots on the black carapace . . . *Clemmys guttata* . . . Accomac, Alexandria, Elizabeth City, Fairfax, Frederick, Norfolk.
- EE. Larger, no yellow spots.
- F. Carapace not keeled. Edge of lower jaw saw-like and jagged.

- G. Edge of upper jaw jagged, plastron red. . .
"Slider". . . *Pseudemys rubriventris*. . . *Accomac*, Fairfax.
- GG. Edge of upper jaw not jagged, plastron yellow. "Slider". . . *Pseudemys concinna*. Fairfax, Norfolk.
- FF. Carapace keeled, edge of lower jaw smooth.
- G. Plates of carapace without rough concentric ridges.
- H. Keel without knobs on ends of neural plates. Spot behind eye triangular. . . *Gratemys geographica*. . . *Nansemond*, Washington.
- HH. Keel with knobs on ends of neural plates. Spot behind eye L-shaped. . . *Gratemys pseudogeographica*. . . *Alexandria*.
- GG. Plates of carapace with rough concentric ridges. . . "Diamond-back terrapin". . . *Maldaclemys centrata concentrica*. . . *Northampton*, "York river mouth," "Chesapeake Bay".

SAURIA (LIZARDS).

- A. No limbs. . . "Glass snake". . . *Ophisaurus ventralis*. . . *Brunswick*, Hanover, *Nansemond*.
- AA. Limbs present.
- B. Scales large and rough. Markings of wavy cross-bars. . . "Fence lizard."
Sceloporus undulatus. . . *Alexandria*, *Alleghany*, *Amelia*, *Amherst*, *Augusta*, *Bath*, *Caroline*, *Clarke*, *Fairfax*, *Fauquier*, *Henrico*, *Highland*, *Mecklenburg*, *Nelson*, *Norfolk*, *Northampton*, *Princess Anne*, *Prince William*, *Roanoke*, *Rockbridge*, *Shenandoah*, *Southampton*, *Spottsylvania*, *Wythe*.
- BB. Scales smooth, color uniform or striped lengthwise.
- C. Limbs smaller, not meeting when pressed to sides.
Brown, a darker stripe on each side . . . *Leiopisma laterale*. . . *Fairfax*, *Nansemond*, *Northampton*.
- CC. Limbs larger, overlapping when pressed to sides.
- D. Striped lengthwise.
- E. Brown, with six white stripes. Tail brown.
"Sand-lapper".
Cnemidophorus sexlineatus. . . *Caroline*, *Elizabeth City*, *Nansemond*, *Nelson*, *Norfolk*, "York river".

- E. Black with five white stropes, Tail blue.
 "Scorpion". *Plestiodon fasciatus* (Young). .
 Alleghany, Amelia, Augusta, Caroline, Fairfax,
 Gloucester, Mecklenburg, Nelson, Norfolk,
 Prince William, Rockbridge.
- DD. Brown, head red. . . "Scorpion," *Plestiodon
 fasciatus* (Adult) . . (See above).

SERPENTES (SNAKES).

- A. Poisonous species, with an erectile fang (long hollow
 tooth) in the upper jaw, a pit between the eye and
 the nostril, vertical pupil, undivided subcaudal
 plates, and keeled scales.
- B. A rattle at end of tail . . . "Rattlesnake" . . . *Cro-
 talus horridus*. .
 Augusta, Bedford, Buckingham, Clarke, Loudoun,
 Nelson, Rappahannock.
- BB. No rattle.
- C. Smaller, reaches 3 $\frac{1}{2}$ feet, light brown with darker
 hour-glass markings across back, head copper-
 color . . . "Copperhead." . . .
Agkistrodon mokasen. . . Augusta, Caroline,
 Clarke, Culpepper, Fairfax, Loudoun, Madison,
 Nelson, Page, Rockingham, Shenandoah.
- CC. Larger, reaches 6 feet, markings similar, but
 color much darker and more obscure, head black-
 ish. . . "Cottonmouth water moccasin".
Agkistrodon piscivorus . . . Norfolk.
- AA. Harmless species, with no fang, no pit, round pupil,
 and divided subcaudals.
- B. Scales keeled.
- C. Anal plate single.
- D. Blackish with three light stripes.
- E. Lateral stripe on scale rows 3 and 4. "Ribbon
 snake".
Thamnophis sauritus. . . Alexandria, Augusta,
 Clarke, Norfolk, Northampton.
- EE. Lateral stripe on scale rows 2 and 3. "Garter
 snake." "First and last". . . *Thamnophis sirtalis*
 . . . Alexandria, Alleghany, Augusta,
 Caroline, Clarke, Fairfax, Gloucester, Madison,
 Nansemond, Nelson, Page.
- DD. White with black spots on back. . . "Bull snake".
Pituophis melanoleucus. . . Bath.
- C. Anal plate divided.

D. Snout turned up, pointed . . . "Spread-head".

Heterodon contortrix.

Accomac, Caroline, Clarke, Elizabeth City,
 Fairfax, Fluvanna, Hanover, Loudoun, Mont-
 gomery, Nelson, Norfolk, King George, North-
 ampton, Princess Anne, Rockingham, "Rappa-
 hannock river", "Hampton Roads".

DD. Snout not turned up.

E. Belly uniform color.

F. Green above and below . . . "Green snake".

Opheodrys aestivus.

Accomac, Alexandria, Buckingham, Caroline,
 Dinwiddie, Fairfax, Gloucester, Nelson,
 Northampton.

F. Brown above.

G. Belly pale brown.

H. No light stripe above. . . *Potamophis striatulus*. . . Henrico.HH. A light stripe above. . . *Storeria dekayi*.
 Alexandria, Fairfax, Nelson, Norfolk.GG. Belly red. *Storeria occipitomaculata*. . . Augusta, Craig, Fairfax, Gloucester,
 Nelson.

EE. Belly not uniform color.

Belly with two brown stripes. Brown, 3 black
 stripes on back, a light stripe on each side. . .
Natrix septemvittata. . . Alexandria, Clarke,
 Fairfax, Fauquier, Loudoun, Nelson.

FF. Belly without stripes.

G. Belly without spots, white in front and black
 behind. Snake black above (adult) or with
 brown spots (young). . . "Mountain black
 snake."

Elaphe obsoleta. . . Alexandria, Clarke, Eliza-
 beth City, Fairfax, Nelson, Norfolk, Page,
 Wythe, "Bull Run".

GG. Belly spotted.

H. Bars or spots on back.

I. Red black-bordered spots on back. Belly
 checkered black and white.

"Corn snake". . . *Elaphe guttata*. . . Alle-
 gheny, Madison, Nelson, Roanoke.

II. Brown bars across back, belly spotted with
 red and black.

"Water moccasin". . . *Natrix sipedon*. .

Accomac, Alexandria, Alleghany, Bath, Bland,

- Buckingham, Chesterfield, Clarke, Fairfax, Fauquier, Loudoun, Nelson, Norfolk, Northampton, Prince William, Roanoke, Westmoreland, Wythe, "Holston river".
- HH. Back uniform color, belly spotted with red and black.
Natrix sipedon, brown phase. (See above).
- BB. Scales smooth.
- C. Anal plate single.
- D. Snake ringed with red, black, and yellow.
Lampropeltis elapsoides. . . Mecklenburg.
- DD. Snake not ringed, spotted.
- E. Belly checkered black and white or black and yellow.
- F. Brown or red black-bordered spots above. . .
 "House moccasin".
Lampropeltis triangulum. . . Albemarle, Alexandria, Appomattox, Augusta, Clarke, Page, Roanoke.
- FF. Narrow yellow chain-markings above. "King Snake".
Lampropeltis getulus. . . Alexandria, Caroline, Elizabeth City, Fairfax, Gloucester, Nelson, Norfolk, Princess Anne, Southampton, Spottsylvania.
- EE. Belly mottled reddish. Brown with darker brown spots.
 "Molecatcher". . . *Lampropeltis rhombomaculata* . . . Alexandria, Appomattox, Fairfax, Nelson, "Bull Run."
- CC. Anal divided.
- D. Body with definite markings.
- E. Markings of stripes (black, 3 red stripes). .
Abastor erythrogrammus. . . "Pamunkey river".
- EE. Markings of spots or bars.
- F. Red bars on sides, Belly red. . *Farancia abacura*. . . Amelia, Nansemond.
- FF. Brown spots on back. Belly uniform grayish. . . "Black racer" (young). *Coluber constrictor* . . . Accomac, Alexandria, Caroline Clarke, Fairfax, Nelson, Norfolk, Northampton, Princess Anne, Prince William, Rappahannock, Roanoke, Wythe.
- DD. Body without markings.

- E. Throat white, belly black . . . "Black racer"
(adult) *Coluber constrictor* (see above).
- EE. Throat and belly same color.
- F. Black, a light ring around neck. Belly red. . .
Diadophis punctatus. . . Albemarle, Alexandria,
Augusta, Bedford, Clarke, Fairfax, Nelson,
Page, Shenandoah.
- FF. No ring around neck.
- G. Green above. . . *Liopeltis vernalis*. . . Amelia.
- GG. Brown above.
- H. Belly pale brown. . . *Virginia valeriae*. . . .
Alexandria, Clarke, Fairfax, Nelson, North-
ampton.
- HH. Belly red . . . *Carphophis amoenus* . . .
Albemarle, Alexandria, Clarke, Fairfax, Nelson,
Wythe.



